The International Journal of Management Education 12 (2014) 317–332

Contents lists available at ScienceDirect

The International Journal of Management Education

journal homepage: www.elsevier.com/locate/ijme

Entrepreneurship education at Nordic technical higher education institutions: Comparing and contrasting program designs and content

Jan P. Warhuus [a, *], Rajiv Vaid Basaiawmoit [b]

[a] Department of Business Administration, School of Business and Social Sciences, Aarhus University, Bartholins Allé 10, Bldg. 1327-118, DK-8000 Aarhus C, Denmark
[b] AU Centre for Entrepreneurship and Innovation, Aarhus University, Finlandsgade 27, Bldg. 5361, DK-8200 Aarhus N, Denmark

ARTICLE INFO

Article history:
Received 1 February 2014
Received in revised form 28 June 2014
Accepted 23 July 2014
Available online 6 September 2014

Keywords:
Entrepreneurship education
STEM entrepreneurship
Program design
Progression in entrepreneurship education
Program impact
Higher education

ABSTRACT

In higher education (HE), science and technology (STEM) institutions were early adopters of entrepreneurship education, recognizing that STEM majors in particular have a disproportional potential to form high-growth ventures in high-tech industries with high-value prospects. Yet, only limited empirical work has been carried out to shed light on how these programs are developed and how and why they are designed and organized the way that they are. What we do know typically comes to us from single-case reports on isolated programs. This study aims to provide deeper insights through an innovative and comprehensive research design that provides a way to compare and contrast case studies of five programs, developed by different educators, in different Nordic nations, and at different HE STEM institutions. The study mainly aims to explore how these cross-case and cross-national studies can guide future entrepreneurship education program development. However, considering the deliberate selection of comparable cases, this study finds a striking diversity in effective and successful programs, and uncovers strong interdependencies between program design and inception and the program developers. As such, in addition to providing guidance for program developers, the study identifies implications for other stakeholders, including students, university management, and entrepreneurship education research.

1. Introduction

For university graduates, the Baby-Boom generation's ability to rely on large, mainly manufacturing corporations to provide attractive career paths and prosperity is long gone (Duval-Couetil, 2013; Matlay, 2011). Meanwhile, entrepreneurship education (EEd) as a Higher Education (HE) discipline has been stuck in neutral, concerned with whether entrepreneurship

Abbreviations: HE, higher education; STEM, science, technology, engineering, and mathematics; EEd, Entrepreneurship Education; GEM, Global Entrepreneurship Monitor; N5T, "NordicFiveTech", a strategic alliance of leading Nordic technical universities; DTU, Technical University of Denmark; Aalto, Aalto University; NTNU, Norwegian University of Science and Technology; AU, Aarhus University; Chalmers, Chalmers University of Technology; KTH, Royal Institute of Technology; KU, Copenhagen University; SSES, Stockholm School of Entrepreneurship.

* Corresponding author. Tel.: +45 87 166 041.
E-mail address: jan.warhuus@badm.au.dk (J.P. Warhuus).
URL: http://www.au.dk

http://dx.doi.org/10.1016/j.ijme.2014.07.004
1472-8117/

can be taught, and only recently moved in to gear, to focus on what and how it should be taught (Karlsson & Moberg, 2013; Kuratko, 2005; Lautenschläger & Haase, 2011; Mwasalwiba, 2010). For this and other reasons, only recently have HE stakeholders outside of walls of the business school begun to adopt an understanding of the importance of entrepreneurship (Carey & Matlay, 2010; Hindle, 2007) in preparing graduates for a changed economic infrastructure with significantly fewer career options in large organizations (Keogh & Galloway, 2006; Kirby, 2004).

In this development, Science, Technology, Engineering, and Mathematics (STEM) educations and institutions have been found to be early adopters of EEd (Vesper & Gartner, 1997). STEM majors in particular have a disproportional potential to form high-growth ventures, because high-growth ventures are concentrated in high-technology industries (Autio, 2007; Parthasarathy, Forlani, & Meyers, 2012; Schøtt, 2007; Souitaris, Zerbinati, & Al-Laham, 2007) and because their technical training gives them access to "information corridors" and, thus, the prospect to recognize particular entrepreneurial opportunities (Shane & Venkataraman, 2000, p. 222), not readily available to the rest of the population. High-growth ventures are not only attractive prospects for potential STEM entrepreneurs but also central to recent economic policy-making (Levie, Autio, Acs, & Hart, 2014; Stam, Suddle, Hessels, & Van Stel, 2009) as the literature consistently finds these ventures to account for most of the new job creation in developed countries (Davidsson & Delmar, 2006; Morris, 2012; Wong, Ho, & Autio, 2005).

In addition, there exists a strong correlation between high-technology oriented and high-growth firms and the fundamental orientation of the startup as opportunity-based, rather than necessity-based (Hechavarria & Reynolds, 2009). Technology and industry ventures are started by individuals with higher levels of education (Autio & Acs, 2010; Blanchflower, 2004; Schøtt, 2011; Xavier, Kelley, Kew, Herrington, & Vorderwülbecke, 2012), indicating that pursuing opportunity-based industry and high-technology startups requires an entrepreneurial skill- and mind-set, which can only be acquired prior to new venture formation through education and training. Yet, a person's level of education is not an indication of that person's exposure to entrepreneurship training. For example, in Denmark, Global Entrepreneurship Monitor (GEM) studies reveal that the higher a person's level of education, the less likely that person is to have received entrepreneurship education or training as part of their education or as an extracurricular offering (Schøtt, 2009). While education generally is regarded as a positive antecedent for entrepreneurial intentions, for HE levels of training, the situation is complex as the opportunity cost (Campbell, 1992) and the complexity of the image/payoff construct (Autio, Keeley, Klofsten, Parker, & Hay, 2001) increases to the point where, in certain situations, more education may have a negative effect on entrepreneurial intentions among technology students (Wu & Wu, 2008) and science and technology graduates may prefer unemployment over self-employment (Napier et al., 2012).

Furthermore, EEd programs can positively affect self-efficacy among a STEM student body that is trained to investigate before they act (Johnson, Craig, & Hildebrand, 2006) and help them take aggressive actions that will make their startup attempts more real to others and thus more likely to succeed (Carter, Gartner, & Reynolds, 1996). This belief and confidence in their intellectual capital should translate seamlessly to the step beyond opportunity recognition and exploitation—that of significant social capital (Ramos-Rodriguez, Medina-Garrido, Lorenzo-Gomez, & Ruiz-Navarro, 2011). Finally, EEd in STEM departments has the potential to stimulate cross-disciplinary action (Weaver, Marchese, Vozikis, & Dickson, 2010), which in turn would lead to more high quality opportunity recognition and pursuit.

Little empirical work has been aimed at understanding how EEd influences STEM students' entrepreneurial intentions in relation to program content, design, and development. The purpose of STEM-based empirical work most often has been to test and refine general entrepreneurship theories (for example entrepreneurial intentions/theory of planned behavior) on students and, out of convenience, the subjects selected were STEM students, even though the purpose of the study was not STEM specific (See, for example, Autio, Keeley, Klofsten, & Ulfstedt, 1997; Luthje & Franke, 2003; Souitaris et al., 2007). Yet, these studies reveal unexpected results (see below) that appear to be discipline specific in nature, which strongly suggest a need for more empirical evidence to inspire and drive further program development and refinement within science and technology.

The few STEM discipline-specific studies on EEd programs are most often single-case studies. A group of studies report on the first two to five years of experience with formation of new programs (e.g., Bilán, Kisenwether, Rzasa, & Wise, 2005; Jaszczak, Bouta, & Raber, 2013; Keogh & Galloway, 2004; Oden, O'Malley, Woods, Kraft, & Burke, 2012; Stone, Raber, Sorby, & Plichta, 2005; Uctu & Jafta, 2013), which may qualify them as single-case studies based on their longitudinal properties (Yin, 2009, p. 49). Most other discipline-specific studies report on initiatives at single institutions; ranging from across campus (e.g., Parthasarathy et al., 2012; Smith, 2008), across STEM disciplines (Watts & Wray, 2012), and across engineering, law, and business disciplines (Sager, Fernández, & Thursby, 2006; Thursby, 2005), to single programs within STEM (Buijs & Beugels, 2007; Handscombe, Rodriguez-Falcon, & Patterson, 2008). A rare exception is Doboli, Kamberova, Impagliazzo, Fu, and Currie (2010) who compare the same program delivered at two different campuses. In addition, these studies share the common trend that the author(s) of these papers are local to the institutions that they are studying, and in many instances are active participants in the programs that they report upon. Thus, despite the significant growth in STEM EEd programs over the past decade, there appears to have been no effort to explore what knowledge may be developed by comparing and contrasting years of program development, refinement, and accumulated experiences across different STEM programs, developed by different educators, at different HE institutions in different countries, or any combination hereof.

The aim of this paper is two-fold. First, the aim to explore how EEd programs at Nordic STEM institutions have been developed, and how and why they are designed and organized the way that they are. Second, the aim is to use this insight to compare and contrast different programs, developed by different educators, in different nations, and at different HE